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Sertifikaat   *Certificate*

REPUBLIEK VAN SUID AFRIKA   REPUBLIC OF SOUTH AFRICA

PATENT KANTOOR   *PATENT OFFICE*
DEPARTEMENT VAN HANDEL   *DEPARTMENT OF TRADE AND*
EN NYWERHEID   *INDUSTRY*

Hiermee word gesertifiseer dat
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WIPO   PCT

the documents annexed hereto are true copies of:

Application forms P.1, P2, provisional specification and drawing of South

African Patent Application No. 2003/5561 as originally filed in the Republic of

South Africa on 18 July 2003 in the name of DETNET SOLUTIONS (PTY) LTD

and an applicant substituted to DETNET SOUTH AFRICA (PTY) LTD on 01 July

2004 for an invention entitled: " BLASTING SYSTEM AND PROGRAMMING OF
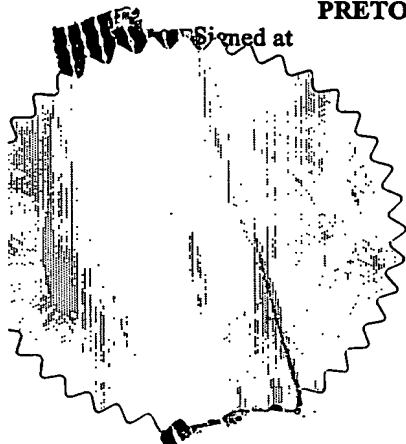
DETONATORS."

**PRIORITY
DOCUMENT**
SUBMITTED OR TRANSMITTED IN
COMPLIANCE WITH RULE 17.1(a) OR (b)

Geteken te   in die Republiek van Suid-Afrika, hierdie   dag van
PRETORIA   26th   **July 2004**
Signed at   in the Republic of South Africa, this   day of

Registrar of Patents

REPUBLIC OF SOUTH AFRICA				PATENTS ACT, 1978		
		REGISTRAR OF PATENTS				

Official Application No.			Lodging date: Provisional		Acceptance date:	
21. 01. **2003/5561**		22	18 July 2003	47		
International classification			Lodging date: Complete		Granted date:	
51		23				

Full name(s) of applicant(s)/Patentee(s)	
71	DETNET SOLUTIONS (PTY) LTD

Applicant(s) substituted:		Date Registered:
71	~~DETNET~~ DETNET South Africa (Pty) Ltd	01.07.04

Assignee(s):	Date Registered:
71	

Full name(s) of inventor(s).	
72	LABUSCHAGNE, Albertus Abraham

Priority claimed		Country		Number		Date
Note:	33	NONE	31	NONE	32	NONE
Use International	33		31		32	
Abbreviation for Country	33		31		32	

Title of Invention:
54   BLASTING SYSTEM AND PROGRAMMING OF DETONATORS

Address of applicant(s)/patentee(s)
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Patent of Addition to Patent No.:	Date of any change:	
61		
Fresh Application based on:	Date of any change:	

REPUBLIK VAN SUID-AFRIKA
REVENUE INKOMSTE 18.7.03
R 006000
FTR 074
REPUBLIC OF SOUTH-AFRICA

REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978

APPLICATION FOR A PATENT AND ACKNOWLEDGEMENT OF RECEIPT
(Section 30(1) – Regulation 22)

The grant of a patent is hereby requested by the undermentioned applicant on the basis of the present application filed in duplicate

		Revenue Stamps or Revenue Franking Machine Impression

OFFICIAL APPLICATION NO.

21	01	2 0 0 3 / 5 5 6 1

OFFICIAL DATE STAMP

FULL NAME(S) OF APPLICANT(S)

71	DETNET SOLUTIONS (PTY) LTD

ADDRESS(ES) OF APPLICANT(S)

AECI Place, The Woodlands, Woodlands Drive, Woodmeand, Sandton

TITLE OF INVENTION

54	BLASTING SYSTEM AND PROGRAMMING OF DETONATORS

Priority is claimed as set out on the accompanying Form P2.

The earliest priority claimed is: NONE

This application is a patent of addition to Patent Application No.	21	01	

This application is a fresh application in terms of section 37 and based on Application No.	21	01	

THIS APPLICATION IS ACCOMPANIED BY:

- ☒ 1   A single copy of a provisional specification of ...7... pages
- ☐ 2   Two copies of a complete specification of ...... pages
- ☒ 3   ...1... Sheets of Informal Drawings
- ☐ 4   .... Sheets of Formal Drawings
- ☐ 5   Publication particulars and abstract (Form P8 in duplicate)
- ☐ 6   A copy of Figure .... of drawings (if any) for the abstract
- ☐ 7   Assignment of Invention
- ☐ 8   Certified priority document(s) Number(s)
- ☐ 9   Translation of priority document(s)
- ☐ 10   An assignment of priority rights
- ☐ 11   A copy of the Form P2 and the specification of SA Patent Application
- ☐ 12   A declaration and power of attorney on Form P3
- ☐ 13   Request for ante-dating on Form P4
- ☐ 14   Request for classification on Form P9
- ☒ 15   Form P2 in duplicate

21	01	

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Dated 18 July 2003

McCALLUM, RADEMEYER & FREIMOND
PATENT AGENTS FOR APPLICANT(S)

Received – Official Date Stamp
REGISTRAR OF PATENTS DESIGNS,
TRADE MARKS AND COPYRIGHT
REGISTRAR OF PATENTS
2003-07-18
REGISTRATEUR VAN PATENTE, MODELLE,
HANDELSMERKE EN OUTEURSREG

REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978

PROVISIONAL SPECIFICATION

(Section 30(1) – Regulation 27)

OFFICIAL APPLICATION NO		LODGING DATE	
21. 01.	2003/5561	22	18 July 2003

FULL NAME(S) OF APPLICANT(S)

71	DETNET SOLUTIONS (PTY) LTD

FULL NAME(S) OF INVENTOR(S)

72	LABUSCHAGNE, Albertus Abraham

TITLE OF INVENTION

54	BLASTING SYSTEM AND PROGRAMMING OF DETONATORS

BACKGROUND OF THE INVENTION

[0001] This invention relates generally to a blasting system and more particularly is concerned with the programming of each of a plurality of electronic delay detonators, to be used in a sequential blasting operation, with

5   blast timing signals.

SUMMARY OF INVENTION

[0002] The invention provides, in the first instance, a method of programming a plurality of detonators which are connectable in sequence to a communications bus, the method including the steps of enabling a first

10   detonator in the sequence, using the communications bus to exchange at least programming data between a control unit and the first detonator, disabling the first detonator by means of a signal sent on the communications bus and, when the first detonator is disabled, using the first detonator to enable a second detonator which follows the first detonator.

15   [0003] The aforementioned method can be carried out for each of the detonators in the sequence.

[0004] In order for a detonator in the sequence to enable a following detonator, the invention provides that the detonators are preferably connected to each other using a daisy chain system.

[0005] The invention also extends to a method of programming a plurality of detonators in sequence which includes the steps of programming a first detonator using a communications bus to which all of the detonators are connected in parallel, disabling the first detonator by means of a signal sent on the communications bus and, when the first detonator is disabled, using the first detonator to enable a second detonator.

[0006] The invention also provides a blasting system which includes a control unit, a communications bus which is connected to the control unit, a plurality of individually programmable detonators which are connected in sequence to the communications bus along its length, and a daisy chain connection between the control unit and the detonators, and wherein, within the sequence of detonators, when a first detonator is disabled by a signal on the communications bus, the first detonator makes use of the daisy chain connection to enable a second following detonator so that data can be exchanged between the control unit and the second detonator using the communications bus.

BRIEF DESCRIPTION OF THE DRAWING

[0007] The invention is further described by way of example with reference to the accompanying drawing which illustrates a blasting system according to the invention.

DESCRIPTION OF PREFERRED EMBODIMENT

[0008] The accompanying drawing illustrates a blasting system 10 according to the invention.

[0009] The blasting system includes a control unit 12 to which is connected a communications bus 14 and a daisy chain system 16. The control unit has terminals 18A and 18B to which the lines of the communications bus are connected, and terminals 18C and 18D to which a daisy chain line 24 and a return line 26 are connected.

[0010] A plurality of individually programmable electronic delay detonators 30 are included in the system. The detonators are individually designated 30A, 30B, 30C ..... 30N. The number of detonators in the sequence and their specific nature are determined according to requirement. These aspects are not further described for generally they are known in the art. Each detonator has respective terminals A, B, C and D.

[0011] Each detonator 30 is connected in parallel to the communications bus 14 via the terminals A and B, and, within the daisy chain system, the detonators are essentially connected in series via the line 24 and the terminals C and D.

[0012] The detonator sequence terminates in a device 32 which is connected to the daisy chain line 24 and the return line 26.

[0013] In practice each detonator 30 is positioned in a blast hole adjacent the explosive material using techniques which are known in the art. The control unit 12 is used for programming the individual detonators with timing information which ensures that the detonators initiate the respective explosive

5   charges at precisely determined intervals to obtain a desired blasting pattern.

[0014] In the system of the invention, in order to program each detonator individually, it is necessary to control access to the detonators on a case-by-case basis. Initially the output 18D on the control unit and the terminals D on the respective detonators are in an inactive or default state and no detonator

10   will respond to information on the communications bus 14.

[0015] The control unit 12 is used to activate the terminal 18D and a signal is sent to terminal C on the detonator 30A to enable the detonator. The control unit 12 thereafter sends a "connect daisy" command on the communications bus 14 and, as the detonator 30A has been enabled, the detonator responds

15   to the connect daisy command and is thereby connected, for communication purposes, to the control unit via the communications bus 14. The remaining detonators in the sequence, during this process, are not enabled and hence remain inactive.

[0016] The detonator 30A can then be programmed directly from the control

20   unit. The identity of the detonator 30A is recorded by the control unit and relevant timing information, which has previously been determined, is transferred from the control unit to the detonator 30A to program the detonator according to requirement.

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[0017] After the transaction between the control unit and the detonator 30A has been completed the control unit sends a signal on the communications bus to disable the detonator 30A ie. to disconnect from the bus 14. When this happens the detonator 30A automatically transmits an enabling signal to the terminal C on the detonator 30B. Thereafter the controller sends a connect daisy command on the communications bus which is received by the detonator 30B and, in a process similar to what has been described, the detonator 30B can then be programmed according to requirement.

[0018] The enabling signal which goes from one detonator to a following detonator may be of a monostable nature and preferably comprises a single burst of information which is coded in the time domain for security and reliability reasons. This is advantageous for it results in more security on the daisy chain. This is due to the fact that the coded information cannot easily be simulated by stray factors eg. leakage of voltage or current from a capacitor, an event which can readily effect a stable state or logic level used in place of the coded information approach to control the enablement of a following detonator.

[0019] The aforementioned process is repeated along the detonator chain with each detonator, when it is disconnected from the bus 14, automatically enabling a following detonator in the sequence so that the following detonator can be programmed by the control unit.
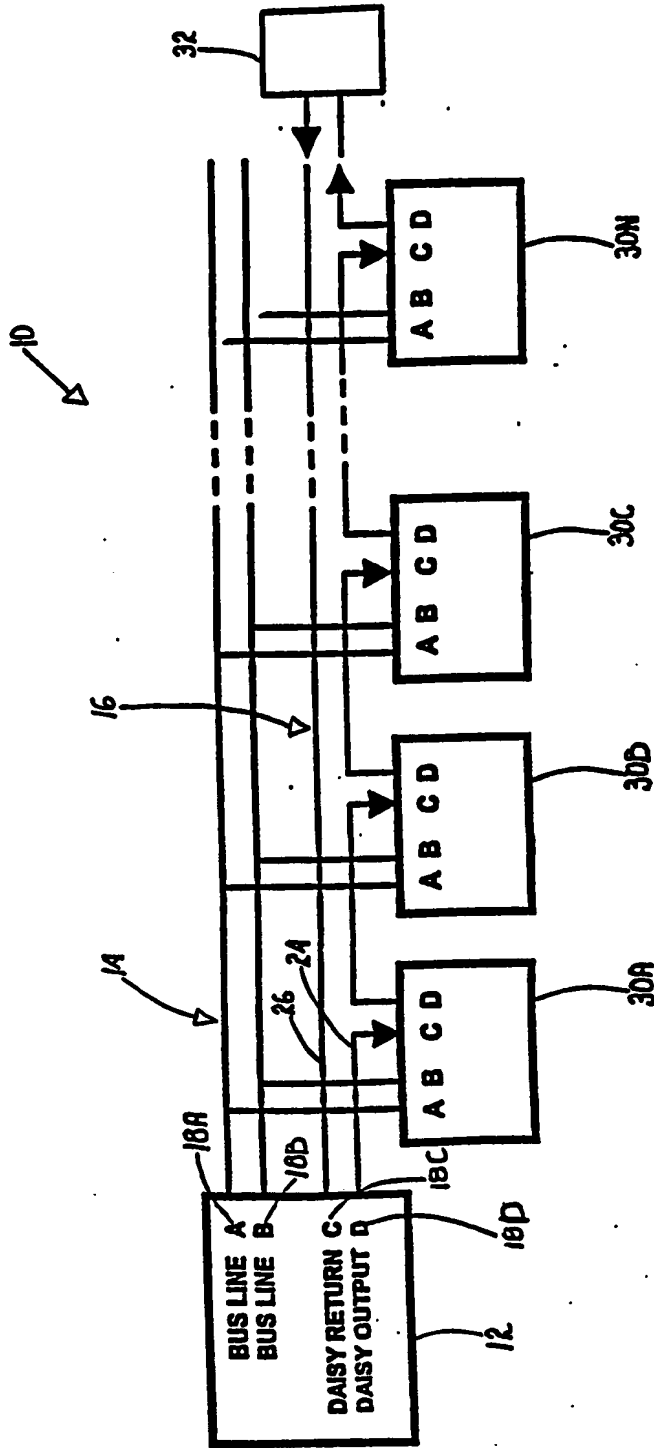
[0020] Once the last detonator 30N in the sequence has been programmed a signal output from its terminal D is received by the termination device 32 and

is returned via the return line 26 to the control unit. This allows the control unit to determine that the sequence of transactions has reached the end of the installation.

[0021] The blasting system of the invention allows the identity of each detonator to be recorded in the control unit and for a predetermined time delay to be assigned to each of the detonators. The consecutive detonators are connected to the control unit in the sequence in which they are physically connected to the harness. If required, and depending on the installation conditions, the time delay between successive detonators in the sequence can be automatically implemented. Once the programming sequence has been initiated it is carried out without human intervention and this reduces the likelihood of human error occurring. The direct and automatic enabling of a following detonator by a preceding detonator saves time in the overall communications protocol, and reduces the possibility of environmental interference and the likelihood of human and equipment error.

Dated this 18th day of July 2003.

McCALLUM, RADEMEYER & FREIMOND
Patent Agents for the Applicant